A 10 YEAR RETROSPECTIVE EVALUATION OF BOEY SCORE IN PATIENTS WITH PERFORATED PEPTIC ULCER IN HOSPITAL UNIVERSITI SAINS MALAYSIA

(JANUARY 2004-DECEMBER 2014)

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DISSERTATION SUBMITTED IN PARTIAL FULLFILLMENT OF THE REQUIREMENT FOR THE DEGREE OF MASTER OF MEDICINE (GENERAL SURGERY)

NOVEMBER 2015

ACKNOWLEDGEMENT

I thank the Almighty God for giving me the courage, inspiration and motivation and also one way or another honored me to be part of this project. The strength and mobility to pay attention and commitment in fulfilling my task designed by me with the others assistance. Always done with the blessing of the Almighty.

My beloved wife Dr.Vasumathy ,daughter Leshimita Shree Reddy , son Sashviinth Reddy , father Rajan Naidu A/L Rajan and mother Valliamma A/P Henry also played a pivotal role in sacrificing time to complete this dissertation. Their willingness and sacrifices are immeasurable. They stood as a pillar in all situations and circumstances.

Thanks for the undivided support and constant assistance rendered by my supervisor Dr.Meehbob Alam Pasha and Head of Department of Surgery HUSM, Dr.Zaidi Zakaria in guiding me in managing the correct methods, approaches techniques and strategies to be used to make it a quality research product.

I appreciate and value the strong and brave patients who had undergone the tests of their life during their involvement with perforated peptic ulcer and the painful treatments which comes along with it. Some of them are not with us today but I pray their soul will be blessed and rest in peace. Without their commitment in the process of my research, none of these work would be accomplished and materialized

Thanks to my statistician, Mrs.Siti Farliza who helped me in preparing this dissertation with intricate statistical analysis and calculations. Thank you for your patience and assistance during the duration of my work.

I also wish to express my gratitude and appreciation in general to everyone of them who had contributed, assisted, guided and supported me until the completion of this dissertation. Thank you again for all the wonderful, loving and caring spirit.

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ABBREVIATIONS

PPU : Perforated Peptic Ulcer

HUSM: Hospital Universiti Sains Malaysia

HCl: Hydrochloric acid

SIRS: Systemic Inflammatory Response Syndrome

MPI: Manheim Peritonitis Index

ASA: *American Society of Anesthesiologists*

PS: Physical Status

AaDO2: Alveolar artery oxygen gradient

PO2: Partial pressure of oxygen pressure in arterial blood

FiO2: Fraction of Inspired oxygen

PPI: Proton pump inhibitor

ABSTRACT

Topic : A 10 years retrospective evaluation of Boey Score in patients with perforated peptic ulcer in HUSM from January 2004 until December 2014**.**

Introduction: For decades, PPU was treated without any risk stratifications though it carries high risk of mortality. Risk stratification is appropriate and imperative to study independent risk factors belonging to patients with particular disease and predict morbidity or mortality.

Objective: The objective of this study was to evaluate the Boey Scores in determining mortality outcome of patients presented with PPU.

Patients and Methods: The study population consisted of patients who underwent surgery for PPU during the period of January 2004 until December 2014. The number of patients involved in the study were 82. The medical records were traced from the hospital records department after it was permitted by the Director of the hospital.. The relevant socio-demographic, clinical, operative notes and survival status were entered into proforma form. All the data recorded were transferred into SPSS software version 21 and analyzed. Pearson chi-square was used as a statistical test. Significant differences were taken into account if the probability or p value is equal or less than 0.05

Results : The mean age of the PPU patients in this study was 68.5. Malays were the predominant race treated for perforated peptic ulcer. Male patients were higher compared to female with a ratio of 2:1. All the risk factors in Boey scores appeared to be statistically significant in predicting mortality except for the delayed treatment with the range of more or less than 24 hours. Apart from these variables, statistics showes age proven to be a significant risk factor in

predicting mortality with the p value of 0.02. Statistically, Boey scores were highly significant in predicting mortality with the p value of < 0.001. This study recorded patients with risk score of zero, one, two, and three has mortality of 0%, 24%, 44% and 32% respectively.

Conclusion: Boey scores would be a good scoring system to be used for risk stratification in patients with PPU. Apart from its simplicity, this score statistically proved to be significant in predicting mortality. Age appears to be another statistically proven independent risk factor in this study. However, further studies are needed to study actual outcome in detail.

ABSTRAK

Tajuk : Penilaian retrospektif '*Boey* Score' selama10 tahun pada pesakit 'Perforated Peptic Ulcer' di Hospital Universiti Sains Malaysia dari Januari 2004 hingga Desember 2014.

Latar belakang : Semenjak beberapa abad, 'Perforated peptic Ulcer ' dirawat tanpa sebarang stratifikasi risiko walaupun masalah ini membawa risiko kematian yang tinggi. Stratifikasi risiko adalah penting untuk mengkaji faktor-faktor yang menyebabkan kematian pada pesakit 'Perforated PepticUlcer'. Objektif kajian ini adalah untuk menilai keberkesanaan '*Boey* Score' dalam menentukan hasil kematian pada pesakit 'Perforated Peptic Ulcer'.

Kaedah : Populasi kajian ini terdiri daripada pesakit yang menjalani pembedahan untuk 'Perfora ted Peptic Ulcer' dalam tempoh Januari 2004 hingga Desember 2014. Jumlah pesakit yang termasuk dalam kajian ini adalah sebanyak 82 orang. Rekod perubatan pesakit dirujuk daripada jabatan rekod hospital setelah mendapatkan kebenaran pengarah hospital. Semua data pesakit di masukkan ke dalam borang proforma. Data yang dikumpul telah dimasukkan ke dalam software computer SPSS versi 21 dan dianalisis. 'Pearson chi square' digunakan sebagai ujian statistik. Perbezaan yang signifikan telah diambil kira jika kebarangkalian atau 'p value' adalah sama atau kurang daripada 0.05

Hasil : Umur purata pesakit 'Perforated Pepici Ulcer' dalam kajian saya adalah 68.5. Bangsa melayu adalah bangsa yang dominan dirawat untuk 'Perforated Peptic Ulcer'. Bilangan pesakit lelaki lebih tinggi berbanding pesakit wanita dengan nisbah 2:1. Semua faktor risiko dalam signif ikan dalam meramalkan kematian kecuali faktor risiko kelewatan rawatan yang lebih atau kurang daripada 24 jam. Selain daripada variable ini, umur juga didapati faktor risiko yang signifikan

dalam meramalkan kematian dengan nilai p 0.02. Daripada kajian statistik, '*Boey* Score' didapati signifikan dalam meramalkan kematian dengan nilai $p < 0.001$. Kajian ini mencatatkan pesakit dengan '*Boey* Score' 0,1,2 dan 3 masing-masing mempunyai kadar kematian 0%, 24%, 44% dan 32%.

Kesimpulan : '*Boey* Score' boleh diambil kira sebagai system penilaian yang baik untuk stratifik asi risiko dikalangan pesakit 'Perforated Peptic Ulcer'. Selain daripada kesederhanaan, skor ini juga terbukti secara statistik, signifikan dalam meramalkan kematian. Dengan penambahan fakto r risiko lain dalam '*Boey* Score', ia akan meningkatkan kadar ramalan kematian pada pesakit 'Pe rforated Peptic Ulcer'. Walau bagaimanapun, kajian yang selanjutkan perlu dijalankan untuk membuktikan cadangan ini

CHAPTER 1

INTRODUCTION

1.1 Introduction and history

In the past, healthy individuals have been experiencing sudden onset of abdominal pain, nausea, vomiting and diarrhea without knowing the reasons and subsequently died within short period of time. In the era of no modern facilities to identify the cause, this problem has been linked to poisoning and many innocent people were sent to prison (Baron JH, 2000)**.** In the year of 1670 King Charles I's daughter, Henriette-Anne, at the age of 26 passed away after experiencing abdominal pain for a day. Since poisoning was suspected at that time, autopsy undertaken had discovered a small hole in the anterior wall of stomach. However, this finding was believed to be caused by the dissection knife and not due to perforated peptic ulcer (Baron JH, 1998&2000). In year of 1500, necropsies has been introduced and more routinely performed between year of 1600 and 1800 (Baron JH et al, 2000&2002). As necropsies more routinely performed, doctors had more exposure and familiarized with this pathological condition.

First PPU was repaired with a simple closure by Johan Mikulicz Radecki (1850-1905) who is often referred as the first surgeon. He has mentioned that "Every doctor faced with perforated peptic ulcer of the stomach or duodenum, must consider opening the abdomen, sewing up the hole and averting of possible inflammation by careful cleansing of the abdominal cavity" (Schein M, 2005). The management principle of Johan Mikulicz Radecki in treating still holds true.

1.2 Anatomy

1.2.1 Stomach

Stomach is located between esophagus and duodenum. The shape depends on whether stomach is full or empty. Stomach consists of anterior and posterior surfaces, greater and lesser curvature with cardia and pyloric orifices. Part of the stomach which projects above the cardiac orifices is called fundus. A distinct angle along the lesser curvature is called incisura angularis and the portion of stomach located between incisura angularis and pylorus is called antrum. Pylorus is connected to duodenum and junction between these two structures marked by a constriction externally (Figure 1.1). Besides that a constant vein called Great Vein of Mayo which crosses anterior aspect duodenum is another hallmark sign to differentiate these two distinct structures during surgery.

Stomach is related to the surrounding structures in peritoneal cavity as follows:

1. Anteriorly related to anterior abdominal wall, Left costal margin, diaphragm and Left lobe liver
2. Posteriorly related to lesser sac, pancreas, transverse mesocolon, Left kidney, Left suprarenal, spleen and splenic artery
3. Superiorly related the Left dome of the diaphragm

Greater and lesser omentum are attached to greater and lesser curvature respectively. This omentum contains vascular and lymphatic supply to the stomach. Arterial supply of the stomach consists of left gastric artery, right gastric artery, right gastroepiploic artery, left gastroepiploic artery and short gastric arteries. Whereas lymphatic drainage of stomach follows arterial supply and briefly can be divided into three zones namely zone 1, 2, and 3. Zone 1 drains along the left and right gastric vessels, zone 2 drains along right gastroepiploic vessels to aortic nodes via subpyloric nodes and zone 3 drains along short gastric and splenic vessels to supra pancreatic nodes then finally to aortic nodes.

Understanding of stomach innervation is important in acid reducing surgery. Stomach is innervated by sympathetic and parasympathetic nerves. Sympathetic nerves are derived from T6-T10 segments of the spinal cord through greater splanchnic nerves, celiac and hepatic plexus. Parasympathetic nerves derived from vagus through esophageal plexus and gastric nerves. Anterior gastric nerve contains mainly left vagal fibres and posterior gastric nerve mainly contains of right vagal fibres. Parasympathetic nerves are motor and secremotor to the stomach (Figure 2). This nerve stimulation causes increased motility and gastric juice secretion contains pepsin and HCl acid (Chaurasia BD, 2010)

Function of stomach:

1. Acts primarily as food reservoir
2. Mixes food with gastric juices by peristaltic movement
3. Helps in food digestion
4. Destroys many organisms present in food and drink by HCl
5. Produces abundant of mucous to protect inner layer of stomach wall from HCl acid insult

1.2.2 Duodenum

Small bowel is divided into three parts namely duodenum, jejunum and ileum. Duodenum is C-shaped and divided into 3 parts, D1, D2 and D3 from up to down respectively. Length of the duodenum is about 25 cm and it joins stomach to jejunum.

First part measures approximately 5 cm long. It starts as continuation from pylorus, then move upwards and backwards to the right side of L1 vertebra (Transpyloric plane). This part of duodenum related anteriorly by quadrate lobe of the liver and gall bladder, posteriorly by gastroduodenal artery, bile duct, portal vein and inferior vena cava, superiorly by Foramen of Winslow and inferiorly by head of the pancreas. Erosion into the posterior wall of duodenum may lead massive upper gastrointestinal bleed due to close proximity with gastroduodenal artery.

Second part of the duodenum measures about 8 cm long and it moves down from first part of duodenum in front of hilum of the right kidney. Ampula of Vater is located at the medial side, half way down of this part. Relations of this part of duodenum is as follows:

1. Anterior: Fundus of Gall Bladder, Right lobe liver, transverse colon and coils of small bowel
2. Posterior: Hilum of Right kidney and Right ureter
3. Medial: Head of pancreas, bile duct, main pancreatic duct
4. Lateral: Ascending colon, Hepatic Flexure, Right lobe of liver

Retroperitoneal third part of the duodenum measures approximately 10 cm long where it passes almost horizontally and slightly upwards in front of inferior vena cava. It joins fourth part of the duodenum in front of aorta. Relations of this part of duodenum (Chaurasia BD, 2010):

1. Anterior: Superior mesenteric vessels, Root of mesentery
2. Posterior : Right Ureter, Right psoas major, Right testicular or ovarian vessels, inferior vena cava abdominal aorta
3. Superior : Head of pancreas with uncin

ate process.

4. Inferior: Coils of jejunum

Last part of the duodenum measures 2.5 cm long. It runs upwards and to the left of the aorta until lower border of L2 vertebra where it turns forward to continue as jejunum. Its relations with the surrounding structures are listed below (Ellis H, 2010):

1. Anterior: Transverse colon, Transverse mesocolon, lesser sac and stomach
2. Posterior: Left symphatetic chain, Left renal artery, Left gonadal artery, Inferior Mesenteric Vein
3. Right: Attachment of the upper part of the root of mesentery
4. Left: Left Kidney and Left Ureter
5. Superior: Body of Pancreas

Understanding of the anatomy and its relations to the surrounding structures is important when encountering surgery related to perforated peptic ulcer

1.4 Epidemiology

Perforated peptic ulcer accounts approximately 2-10% and contributes 70 % of mortality rate in patients with peptic ulcer disease **(**Druart ML *et al*, 1997). The incidence of duodenal perforation is 7-10 cases/100000 adults per year (Zittel TT *et al*, 2000). The most common site of perforation is at anterior duodenal wall (60%), followed by antrum (20%) and lesser curvature of the stomach (20%) (Zittel TT *et al*, 2000).The prevalence of duodenal ulcer is higher in western population,whereas gastric ulcer is more frequently seen in oriental countries. In comparison, gastric ulcers has been shown higher mortality and morbidity resulting from bleeding, perforation and obstruction compared to duodenal ulcers (Sivri B, 2004). Previously, PPU was commonly seen in younger population age group especially in males, but currently this condition is more commonly seen in older age group especially in females. The peak incidence of PPU patients is between age 40-60 ((Lunevicius R *et al*, 2005). PPU which requires surgery as treatment still remains significant. The mortality from PPU has not decreased over the years and data shows PPU causes 20000 to 30000 deaths per annum in Europe (Zittel TT *et al*, 2000). This condition strongly correlates with consumption of aspirin and NSAID (Lagoo S *et al*, 2002).

1.5 Etiology and Clinical Presentation

Smoking is one of the most important risk factor causing perforated peptic ulcer. A Norwegian study shows strong correlation between smoking and peptic ulcer perforation (Svanes,C et al, 1997). The risk of getting PPU increase by 10 fold in smokers among both male and female. Smoking accounts for approximately 77% of PPU in patients with age less than 75 years, but it is not a significant risk factors in older age group. The role of smoking in etiology of PPU is proven by studies stating the prevalence of smoking about 84% and 86% in PPU patients (Smedley et al, 1989). Apart from that, Doll et al mentioned that smokers had three fold higher mortality compared to non-smokers in PPU patients (Doll R et al, 1994).

Prolong consumption of NSAIDS is also another well known and important risk factor in causing PPU. It increases the risk fold by 5 to 8 times (Henry et al, 1993). However, contribution of NSAIDS in PPU is still less compared to smoking which is about 1/3 to 1/5 of PPU cases (Svanes, C et al, 1996)

Clinical presentation in PPU patient can be divided into three stages. First stage is symptoms which arise from irritation of peritoneum by gastric contents. This is called chemical peritonism and it usually lasts about six hours from the onset of perforation. Patient may experience sudden onset of abdominal pain more on epigastric area which may radiate to tip of the right shoulder due to irritation of under surface of diaphragm. Subsequently, the pain may radiate to right paracolic gutter when gastric contents move to that area under gravitation force. Patient also may

complaints of vomiting, shortness of breath, and low grade fever. Physical examination may show signs of tachycardia, tachypnoeic, temperature, tenderness and guarding over the centre of the upper abdomen. In late phase, patient may also complaint of pain over the right illiac fossa.

Second stage can be described as the stage of reaction. At this stage, gastric contents which irritates the peritoneum, gets dilute by peritoneal exudates. Despite ongoing, pathological process at this stage, patient may show improvement in symptoms. However, abdominal findings will remain the same. Rectal examination may reveal tenderness at recto-vesical pouch or recto-uterine pouch. Erect chest x-ray may show air under diaphragm in 70% of patients.

Third stage is called stage of diffuse peritonitis and patient may deteriorate in general condition. Loss of intravascular fluid will lead to toxic and dehydrated looking patient. Abdomen maybe rigid and distended and delay in treatment at this stage may result in poor prognosis (S Das, 2010).

1.7 Management

Management on perforated peptic ulcer has different opinions. Perforated peptic ulcer can be treated with conservative or surgical approach. However, surgery remains most important treatment for perforated peptic ulcer.

1.7.1 Non-Surgical Management

Non surgical or conservative management is known as Taylor Method (Dascalescu C *et al,* 2005). In year of 1946 Herman Taylor treated 28 patients with PPU conservatively, with nasogastric tube decompression and narcotics analgesic. Conservative treatment was effective in 74% of patients treated and mortality recorded as 14% due to peritonitis. Results from this study convinced Herman Taylor to treat PPU patients by conservative treatment (Taylor H, 1946). He believed that perforation will seal off by spontaneous adhesion induced by inflammatory process as proposed by Edward Crisp in 1843. Literatures shows that success rate of conservative treatment in PPU patients is approximately 80%. Beside this, studies has reported mortality as high as 50% when conservative management failed and the patient is exposed to risk of delayed treatment (Marshall C et al, 1999).

Prospective study on 82 PPU patients who were managed conservatively has had identified factors attributed to failure of conservative treatment. This includes high volume of pneumoperitoneum in erect abdominal x-ray, tenderness on digital rectal examination, tympanic

abdomen, peritoneal irritation, and age > 59 years (Songne B et al, 2004). Other literatures stated, age more than 70 years, delay for more than 12 hours from onset to initiation of conservative treatment and hemodynamic instability also has significant contribution to morbidity and mortality in PPU patients (Crofts TJ et al, 1989, Zittel TT et al, 2000). These literatures support these group of patients, best to be treated conservatively. However morbidity and mortality accounts 33% and 30% respectively (Bucher P et al, 2007).

Patients in the age group of 59-70 years are in high risk to undergo surgery. These age group of patients usually presents with multiple co-morbidity and deteriorate more rapidly. Interval from onset of perforation to initiation of treatment varies from 12 hours to 24 hours and mortality rises when treatment is delayed for more than 24 hours. Peritonism strongly warrants urgent surgical exploration and conservative treatment is contraindicated in these group of patients (Boey J et al, 1982).

About 10-16% of PPU results from ulcer due to gastric carcinoma (Lehnert T et al, 2000). In conservative management, it is not possible to obtain biopsy to confirm gastric carcinoma (Crofts TJ et al, 1989). Hence it increases the morbidity and mortality if the underlying cause is masked without exploring the abdomen. Oesophagogastroduodenoscopy is warranted after 6 weeks from successful conservative treatment to identify ulcer and confirm absence of gastric carcinoma (Marshall C et al, 1999).

1.7.2 Surgical Approach

Open surgery remains as the mainstay treatment for perforated peptic ulcer. Open techniques has been overcome by laparoscopic technique. Laparoscopic technique has been proven to reduce risk of parietal complications such as wound infection, better post operative respiratory tolerance, shorter hospitalization, reduced post operative pain, and rapid recovery (Mouly C et al, 2013). Moreover, intra-peritoneal adhesions also can be reduced using laparoscopic technique. However, further studies are needed to prove this hypothesis (J. Scholin, 2011).

Laparoscopic repair of PPU was described by Mouret et al. Many literatures on open versus laparoscopic approach showed advantage of laparoscopic technique over open technique (M.L. Druart et al, 1997)

A meta analysis of 13 prospective studies on open versus laparoscopic involving 658 patients favor laparoscopic approach with success rate of 84.7% (H. Lau, 2004). A cochrane meta analysis which combined 3 most recent randomized control studies has shown success rate of 92% (M.J. Bertleff et al, 2010, W.Y. Lau, 1996, W.T. Siu et al, 2002). Mortality associated with laparoscopy and open surgery , reported as 3 to 4.8% and 5.3 to 11% respectively. Post operative pain and usage of analgesia significantly reduced in laparoscopic approach group of patients. However, pneumonitis, suture line leak, intra abdominal collection and post operative ileus in perforated peptic ulcer patients has not reduced significantly in laparoscopic

approach group of patients (H. Lau, 2004). This study also highlighted, no significant difference seen in duration of operation or hospital stay.

Laparoscopic approach converted to open technique seen in approximately 7.9% of cases due to large perforation which is more than 3 cm, fragility of the ulcer margins, difficult ulcer localization, bleeding or poor tolerance for pneumo-peritoneum.

Some of the literatures recommended not to proceed with laparoscopic approach in patients with Boey's score of three due to poor outcome (F.Y. Lee et al, 2001). Contrast enhanced computed tomography scan may assist the surgeon to decide on appropriate surgical approach. Laparoscopic approach is not an ideal technique for large perforation and posteriorly located ulcers. Current level of evidences are still lacking to establish laparoscopic approach as the standard approach for perforated peptic ulcer patients. European association and endoscopic surgery and Italian guidelines suggested Diagnostic Laparoscopy is beneficial when clinical presentation suggestive of perforated peptic ulcer and laparoscopic repair is recommended.

Various techniques are available now to repair PPU. Simple closure without omental patch, simple suture by Cellan-Jones technique with pediculized omental patch, interrupted simple sutures reinforced by omental overlay, suture by Graham technique with free omental patch, 2/3 distal gastrectomy and less frequently vagotomy combined with antrectomy or pyloroplasty (A. Marrie, 1998). Simple closure of the perforation with or without omental patch is the most common procedure usually will be undertaken for perforated peptic ulcer. Omental patch apparently reduces the risk of suture line failure. Technique of closure with or without omentum has been shown no difference in suture line failure, morbidity and mortality (M.J. Bertleff, 2010). Several other studies comparing suture closure with or

without omental patch found no difference in the rate of suture line leak or morbidity and mortality (W.W. Turner Jr et al, 1988, H.C. Lo et al, 2011). Type of procedure to be undertaken for PPU closure is depends on the surgeon's preference and friability of the margin's ulcer. If the ulcer edge is friable, recommended not to suture the perforation and omental patch alone is acceptable (S. Lagoo et al, 2002).

The principal indication for subtotal gastrectomy or vagotomy combined with antrectomy or pyloroplasty were historically recommended for the radical surgical treatment of peptic ulcer under elective circumstances. Subtotal gastrectomy is not commonly done for PPU cases except in cases where perforation associated with severe hemorrhage, chronic pyloric stenosis refractory to medical treatment or endoscopic dilatation and for large perforated gastric ulcer usually more than 3 cm. However, gastrectomy can cause 10-30% of morbidity and 20% of mortality in this setting and should be undertaken with care (K.K. Tan et al, 2012).

Acid reducing procedure was originally proposed to reduce acid secretion in PPU cases. Truncal vagotomy, a procedure to reduce acid secretion by denervating parasymphathetic supply to stomach has been abandoned because of its complication such as dumping syndrome and diarrhea (Gomez et al, 1996). As an alternative to this procedure, selective and highly selective vagotomy has been undertaken to prevent morbidities arise from truncal vagotomy. However literature shows simple closure with proton pump inhibitor therapy still superior than acid reducing procedures (J. Boey et al, 1987). While its efficacy is equivalent, it increases the complexity and duration of the surgery significantly. In year of 2003, questionnaire answered by 700 British surgeons reported that selective vagotomy has been largely abandoned in favor of proton pump inhibitor and eradication treatment of Helicobacter Pylori (A.D. Gilliam et al, 2003).

A prospective study consist of 210 patients, had compared simple suture, suture plus vagotomy and gastrectomy. This study revealed gastrectomy has relative risk of 15 for mortality and relative risk of 21 for morbidity (C. Noguiera et al, 2003). Another recent study conducted in the year of 2011, reported urgent gastrectomy did not increase morbidity or mortality compared to simple suture closure (p value < 0.05). However this study shows rate of blood transfusion and operative duration which are independent risk factors for mortality were significantly higher in gastrectomy. Urgent gastrectomy for PPU is generally not recommended (K. Kuwabara et al, 2011).

In conclusion, simple closure of the edges of the perforated peptic ulcer with or without omental patch remains the common treatment for PPU.

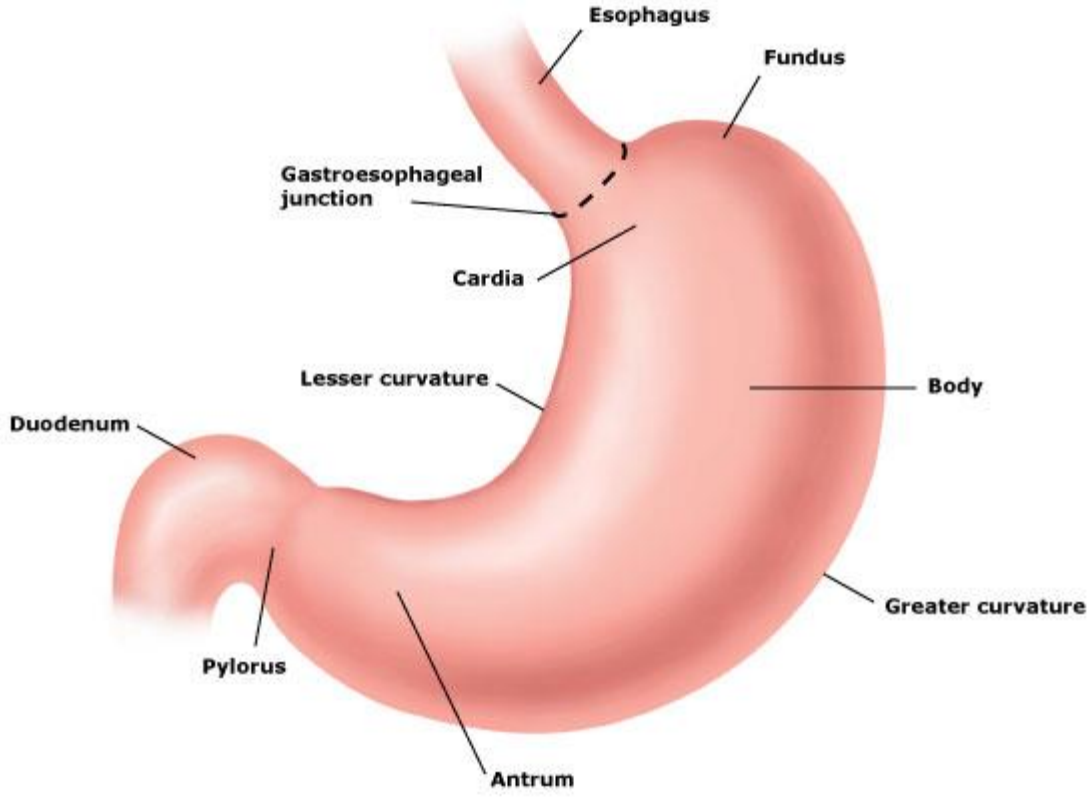

Figure 1.1: Anatomy of the stomach (Image adapted from Chaurasia, B. D. *BD Chaurasia's Human Anatomy*. CBS Publishers & Distributors PVt Ltd., 2010).

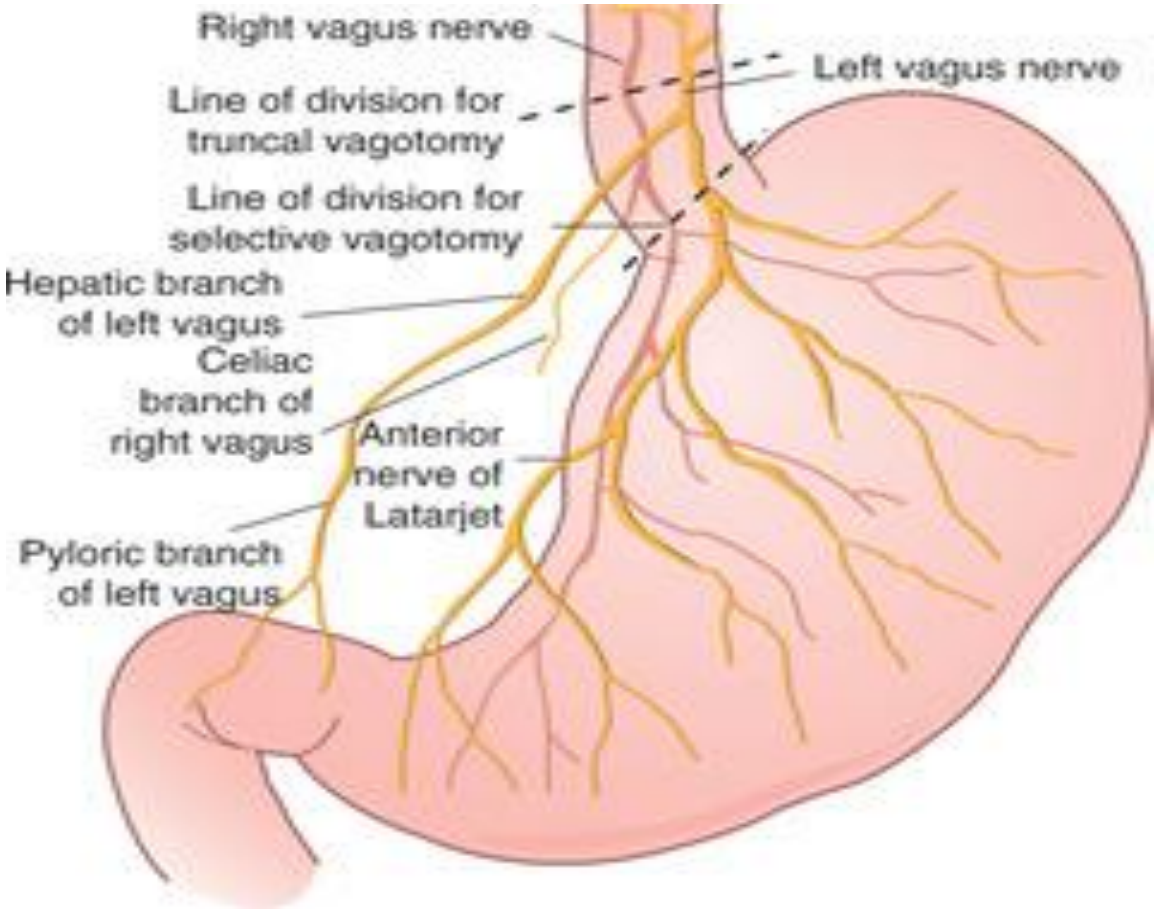

Figure 1.2: Innervation of the stomach (Image adopted from Chaurasia, B. D. *BD Chaurasia's Human Anatomy*. CBS Publishers & Distributors PVt Ltd., 2010).

CHAPTER 2

LITERATURE REVIEW

Boey study was conducted in 1981 by Department of Surgery, University of Hong Kong, Queen Mary Hospital, Hong Kong between November 1978 and July 1981. A total of 213 consecutive patients who presented with acute perforated duodenal ulcers who underwent surgery were selected for this study. This prospective study analyzed operative risk factors for patients with perforated duodenal ulcer. Nine hospital deaths (4.2%) noted from respiratory failure, sepsis, and bleeding. Forty-five complications developed in 27 patients (12.7%). Concurrent medical illness, preoperative shock, and longstanding perforations (more than 48 hours) were significant independent risk factors increased the mortality. Old age, gross peritoneal soiling, and the length of the ulcer history did not affect mortality in the absence of risk factors. No death attributable to either sepsis or abscess formation occurred when surgery was performed within two days of perforation. The author concluded, simple closure of perforated duodenal ulcer will be a better option when any risk factor is present, however definitive surgery in good-risk patients merits further evaluation (Boey et al., 1982).

In 1987, Boey et al conducted another study to validate previously derived set of risk factors and 259 consecutive patients who had simple closure or definitive operation for perforated duodenal ulcers were studied prospectively. Major medical illness, preoperative shock, and longstanding perforation (more than 24 hours) correctly predicted the outcome in 93.8% of patients. Moreover, 16 patients (6.2%) who died after operation could be identified (no false-negative error) prior to surgery if these set of risk factors were applied for risk stratification. The mortality

rate increased progressively with increasing number of risk factors: 0%, 10%, 45.5%, and 100% in patients with none, one, two, and all three risk factors, respectively. These findings underscore the importance of patient selection and the feasibility of a risk grading system in guiding surgical management. Definitive surgery can be done safely in good-risk patients. Simple closure is preferable in those patients with uncomplicated perforations if any risk factor is present. Truncal vagotomy and drainage may be required if there is coexisting bleeding or stenosis. Non-operative treatment deserves re-evaluation in patients with all three risk factors because of their uniformly dismal outcome after operation Boey et al., 1987).

Varut Lohsiriwat et al conducted a study at University Hospital of Bangkok to evaluate the accuracy of Boey score in predicting mortality and morbidity. It was a retrospective study involved all the PPU patients underwent for surgery between 2001 and 2006. In this study, the author compared Boey score with other scoring systems such as American Society of Anaesthesiology score and Manheim Peritonitis Index score. Boey score of 0,1,2,3 showed mortality rate of 1%, 8%, 33% and 38% respectively ($p < 0.001$). The author concluded Boey score is a simple and precise scoring system in predicting mortality in PPU patients after surgery (Lohsiriwat V et al., 2009).

Another prospective study was done to predict the accuracy of Boey score by N J Nwashilli et al and published in 2014 by Africa Journal On line. The main objective of this study was to predict mortality in PPU patients by Boey's score. This study was conducted for one year of duration from September 2009 until August 2010 and involved 26 patients. Outcome from this study showed, mortality was higher in patients with high Boey score, however this results was not statistically significant (Nwashilli et al., 2014).

A study was conducted by Thorsen K et al in Department of Gastrointestinal Surgery, University Hospital of Stavanger, Norway to review the available scoring systems for PPU patients, and assess the evidences from one to another. This study investigated all the available scoring systems which were published from January 2000 until December 2012 to predict mortality and morbidity in PPU patients. The author summarized, there are 10 different scoring systems available to predict outcome in PPU patients namely, the Boey score, the Hacettepescore, the Jabalpur score, the peptic ulcer perforation (PULP) score, the ASA score, the Charlson comorbidity index, the sepsis score, the Mannheim Peritonitis Index (MPI), the Acute physiology and chronic health evaluation II (APACHE II), the simplified acute physiology score II (SAPS II), the Mortality probability models II (MPM II), the Physiological and Operative Severity Score for the enumeration of Mortality and Morbidity physical sub-score (POSSUM-physscore). Among these, 4 scoring systems specifically formed for PPU patients. In conclusion, Boey and ASA score identified to be the most commonly used scoring systems for PPU patients while other scoring systems lack of validation and need further studies to predict the accuracy and findings (Thorsen k et al., 2013)

B Goudar et al has done a study of 180 patients to analyse factors predicting the mortality and morbidity of PPU in a tertiary care centre in Southern India. This retrospective study was conducted from 2006 until 2011. Post-operative morbidity and mortality was recorded as 26.1% and 13.3% respectively. Results from this study was similar to Boey study, whereby mortality rate increased as the score increased from 0 to 3. The author concluded, morbidity and mortality in PPU patients are associated with age, patient's hemodynamic instability, operative delay, site of the ulcer, peritoneal contamination and quality of postoperative care (Goudar B et al., 2010) .

Arici et al conducted study in Department of General Surgery, Akdeniz University Medical Faculty, Antalya, Turkey in the year of 2007 to analyse risk factors predicting mortality and morbidity of peptic ulcer perforations. This study involved 154 patients who were operated for peptic ulcer perforation. It concluded that mortality rate were 0%, 12%, 32% and 63% in patients with score of zero, one, two, and three, respectively ($p < 0.001$). Age, pulse rate at admission and creatinine levels are the independent risk factors associated with prognosis in PPU (Arici et al., 2007)

Another prospective cross sectional study by Munir Ahmad et al conducted in surgical department of Post Graduate Medical Institute Lady Reading Hospital, Peshawar from January 2010 until December 2012 to predict mortality in PPU with high Boey score patients. All patients who have high Boey score were regularly followed until one month after surgery to detect one month mortality. A total of 130 patients of perforated peptic ulcer were included in this study. Mortality in PPU was observed in 33(25.38%) and the author concluded Boey's score was found in majority of mortality cases operated for perforated peptic ulcer and can assist in risk stratification and triage (Ahmad et al., 2014).

In contrary to aforementioned outcomes, D L Buck et al concluded, The Boey score, the ASA score, the APACHE II score, and the sepsis score predict mortality poorly in patients with PPU. They conducted a study to compare the ability of these four clinical prediction score of mortality in PPU patients. It was an observational multicenter study of 117 patients who were surgically treated for PPU from 1 January 2008 until 31 December 2009 from seven gastrointestinal departments in Denmark (Buck et al., 2012) .

CHAPTER 3

MATERIAL AND METHODS

3.0)OBJECTIVES OF THE STUDY

3.1) General Objective :

The main aim of this study is to evaluate the effectiveness of Boey Score in determining mortality in perforated peptic ulcer .

3.2)Specific Objectives :

- To evaluate this scoring system in term of determining risk of mortality following perforated peptic ulcer which were presented to Hospital Universiti Sains Malaysia, Kubang Kerian during the study period.

- To triage perforated peptic ulcer patients based on Boey risk group stratification for admission to intensive care unit , high dependency unit or surgical ward .

- To study the demographic variables of perforated peptic ulcer patients and correlation between these variables such as age, gender, ethnic, site of perforation, and type of surgery with mortality rate which presented to Hospital Universiti Sains Malaysia, Kubang Kerian during this study period.

3.3)Study Design

This is a retrospective study of patients who underwent surgery for PPU in HUSM, Kubang Kerian. All information were collected from registration books, admission books and case notes from record office from January 2004 until December 2013.